



HQ Perspective on MODIS Science Team

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National Aeronautics and Space Administration Headquarters
MODIS Science Team Meeting
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ROSES 2013 A. 28 The Science of Terra and Aqua (and A.46 Terra and Aqua – Algorithms – Existing Data Products)

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“Terra and Aqua” – Overarching Objectives

- Entitled “The Science of Terra and Aqua” since ROSES 2009
- Follow on from the 2009 ROSES Program Element A.41 The Science of Terra and Aqua (NNH09ZDA001N-EOS)
- use of data and derived products from two of the EOS satellites, Terra and Aqua, and their measurement sensors
- a continuation of the research using Terra and Aqua, emphasizes new opportunities for scientists to **analyze and exploit EOS data, develop new products** by combining **multi-sensor and multi-platform data** or by **developing an innovative approach to data retrievals with a focus on integrative research** from these and other satellite (EOS) data to provide answers to NASA's Earth Science Research questions





“Terra and Aqua” – Change from 2009

- Since 2008 NASA HQ and the science team have discussed the inclusion of “Algorithms – Existing Data Products” with the Senior Review Proposals
- Plan is to do this in the next two to four years, need to sync with Senior Review cycle
- No dissenting opinions thus far from HQ or ST
- For ST benefit, we are doing a two step transition: in ROSES A.28, there is no call for “Algorithms – Existing Data Products”
- Terra and Aqua Algorithms – Existing Data Products will be the topic of a separate program element, released Friday, 12 April (A.46)





A.28 - Terra and Aqua – Overarching Objectives

- As Terra and Aqua continue to mature and move into the extended mission phase, less emphasis will be placed upon algorithm refinement, and more emphasis will be directed to multi-sensor product development, accompanied by active utilization of these data and products in scientific research, modeling, synthesis, and diagnostic analysis to answer Earth science questions





A.28 Terra and Aqua – Types of Proposals Solicited

THREE types of proposals are solicited:

2.1 Science Data Analysis

2.1.1 Multi-Platform and Sensor Data Fusion

2.2 Algorithms – New Data Products

2.3 Real- or Near-Real-Time Data Algorithms

Two other topics addressed, direction given:

2.4 Algorithms – Existing Data Product Refinement

3.2 Suomi National Polar-orbiting Partnership (NPP) Science Team





A.28 Terra and Aqua – Types of Proposals Solicited

2.1 Science Data Analysis and sub-topic 2.1.1 Multi-Platform
and Sensor Data Fusion





A.28 Terra and Aqua – Types of Proposals Solicited

2.1 Science Data Analysis

- **Analysis** of Terra and/or Aqua data to answer **disciplinary or interdisciplinary** Earth science research questions. *Must* make scientific use of the data or products from those NASA EOS research sensors listed in Section 5.
- Terra and Aqua **instrument-specific algorithm maintenance/refinement that require research efforts** for maintenance and refinement. Example: deliver major algorithm improvements enabling new research, combined with a plan to undertake the research. Proposal would contain a plan for improvements to the algorithm(s), clear scientific objectives and science questions to be addressed.





A.28 Terra and Aqua – Types of Proposals Solicited

2.1 SDA subtopic on **2.1.1 Multi-Platform and Sensor Data Fusion**

- Terra and Aqua data in conjunction with appropriate data from **other satellites** for **interdisciplinary** studies of the **Earth System**. Science questions that cross traditional NASA Earth Science disciplinary program boundaries. Multimission and multisensor innovative research that can be used to quantify change, characterize processes, and examine function within the Earth System over time. “Mission” = satellite mission and “sensor” = satellite sensor. “Data” must include satellite sensor data products from multiple (at least two) satellite sensors, one of which must be on the Terra and/or Aqua platform, and the other data source must be from a different sensor on a satellite platform.





A.28 Terra and Aqua – Types of Proposals Solicited

2.1 SDA subtopic on **2.1.1 Multi-Platform and Sensor Data Fusion**

- While there is a MODIS sensor and a CERES sensor on board Terra and Aqua, use of the two MODIS or two CERES sensor's data will not fulfill the subelement requirement of two independent data streams. Model output, including data assimilation and reanalysis output, does not qualify as an independent satellite sensor data source. Proposals responding to this program subelement must utilize two or more remote sensing data sets, as defined above, in a greater than marginal application.





A.28 Terra and Aqua – Types of Proposals Solicited

2.2 Algorithms – New Data Products

- Terra and Aqua instrument-specific proposals will be considered from prospective new or continuing science team members who wish to
 - a) advance a new data product that has passed through an Algorithm Theoretical Basis Document (ATBD) review or equivalent process, to implementation as either a core or experimental EOS data product, or
 - b) to introduce a new data product/algorithm development that will yield a new ATBD or equivalent for peer-review.
- Proposals that address new data products/algorithms are expected to detail the instrument-specific algorithm, significant science, supporting and calibration/validation (cal/val) activities, and depending on the maturity of the data product, a timeline or path to delivery of an ATBD or initial data product release to the community.
- Proposed calibration and validation activities may involve a single or multiple data products and/or instruments. Scientific justification for improvements must be compelling; focus of the proposed data product or algorithm or suite of algorithms or instrument(s). **New field validation campaigns not solicited.**
- Specify the instrument or measurement science teams for membership





A.28 Terra and Aqua - Types of Proposals Solicited

2.3 Real- or Near-Real-Time Data Algorithms

- Some of the Terra and Aqua observations have been utilized for operational purposes such as emergency response and/or weather forecasting (e.g., Direct Readout Laboratory (<http://directreadout.sci.gsfc.nasa.gov/>) and Land, Atmosphere Near-Real-Time Capability for EOS (LANCE) (<http://earthdata.nasa.gov/data/near-real-time-data>)).
- Proposals to **enhance, refine, or develop near real time algorithms for application and operational usage** will be considered.





Terra and Aqua – Available Data and Products

- Not all important science questions answered with Terra and Aqua.
- Other *in situ* and/or satellite data may be used in conjunction with Terra and Aqua data; data from Terra and Aqua should play primary role in answering proposal questions
- Earth Science Research Strategy as part of the NASA Science Plan (<http://nasascience.nasa.gov/earth-science>) - Decadal Survey and Climate Initiative
- Proposals that utilize Terra/Aqua data with those from other platforms to answer specific interdisciplinary science questions appropriate in response to 2.1.1, Multi-Platform and Sensor Data Fusion
- Cost of obtaining any needed data should be included
- Info about data: Earth Observing System Project Science Office (EOSPSO) <http://eospso.gsfc.nasa.gov/>.
- Proposals addressing Suomi National Polar-orbiting Partnership (NPP) Science will be solicited in 2013 through the Suomi NPP Science Team program element.
- MODIS, ASTER, MOPITT, MISR, CERES, ATMS/AIRS/AMSU-A; AMSR-E
- **Direct Broadcast**
- **“Dead sensors” – use specified within sensor sections**





A.28 Terra and Aqua – Other Topics

2.4 Algorithms – Existing Data Product Refinement

- This ROSES-2013 program element does NOT include Terra and Aqua algorithms for existing data product maintenance/refinement activities. If a prospective PI wishes to propose refinement to a new or existing algorithm, or an algorithm that has not been through ATBD review, the proposal should be submitted to Section 2.2 Algorithms – New Data Products.
- Topics that were covered by NNH09ZDA001N-EOS that are not covered by the ROSES- 2013 A.28 program element will be addressed by a new ROSES program element/amendment to ROSES-2013 (A.46 – 12 April). This new element will include the opportunity for continuation for proposals/ PIs/data product(s) maintenance selected under the former ROSES-2009 A. 41 Science of Terra and Aqua Algorithms-Existing Data Products topic area, proposals to address “orphan” existing data products that went without a proposal for review in 2009 or earlier, and minimum calibration/validation (cal/val) activities that will be MINOR investments given the maturity of the existing algorithms (minimal cal/val efforts needed to maintain the quality of the existing data products - accommodation of instrument changes). Can be single or multiple data products and/or instruments.





A.28 Terra and Aqua – Other Topics

3.2 Suomi National Polar-Orbiting Partnership (NPP) Science Team

- This ROSES-2013 program element does **not** include Suomi NPP Science Team activities. There will be a separate call for a Suomi NPP Science Team in ROSES-2013 (A.29 Suomi NPP Science Team For Climate Data Records). NASA recognizes that there are strong synergies between EOS and Suomi NPP algorithm-related activities, and that the investigators proposing successor proposals for both EOS and Suomi NPP may experience difficulties in preparing stand-alone proposals in response to each opportunity. Such proposers planning to respond to both solicitations are advised to clearly describe each set of activities in the appropriate proposal and then document the crosscutting synergistic work and costs. Each budget and work plan must be complete and stand-alone. However, budget narratives should include statements regarding the tasks, personnel time, and specific costs that would change if the other proposal were also selected for funding.





A.28 and A.46 Terra and Aqua - Requirements

3.1 Requirements - Error and Uncertainty Analysis

- *All proposals submitted in response to these solicitations must quantify errors and uncertainties associated with the proposed efforts (e.g., data products, scientific data analysis, etc.). The error and uncertainty discussion must be clearly identifiable in a separate section within the proposal body.*





ATBD/Data Product Review

- Review of algorithms for the new and alternative MODIS algorithms
 - **Current algorithms/products** – Algorithm refinement PIs to provide
 - compelling justification for the importance/utility of the algorithm and (as needed) improvements;
 - plan for transition to core production (recognizing infusion of new knowledge)
 - data product documentation broadly reviewed by user communities (web-based posting for review/comments?)
 - regular data product/algorithm reviews – maintain, refine, review as needed
 - **New algorithms/data products** – draft new proposal, documentation and requirements, follow with review and endorsement by user communities
 - Three new algorithms reviewed in 2009 – Ustin (Canopy Water Content), Liang (Surface Radiative Flux), Lyapustin (Multi-angle atmospheric correction)
 - Is there a need for periodic review of ATBDs/Algorithms off-cycle of the competition?
 - Would this help a potential “transition to operational status”?





A.28 and A.46 Terra and Aqua – Instrument or Measurement Teams

Additional detailed guidance for Instrument and Science Measurement Teams in Section 4. Proposed studies may be relevant to more than one team. **Proposals can/should request membership on the team that, to the best of their knowledge, is most relevant to their research and budget for travel to an annual, domestic science team meeting (e.g., four days to the farthest coast).**

Measurement Teams Solicited:

- 4.1 Land Measurements Team (LCLUC)
- 4.2 Ocean Biology & Biogeochemistry Measurements Team (OCRT)
- 4.3 Cryospheric Sciences Measurement Team
- 4.4 Atmospheric Science Measurement Team
- 4.5 Geodynamics and Geohazards Research Team
- 4.6 Biodiversity and Ecological Forecasting Team
- 4.7 Sea Surface Temperature Science Team

- OCRT, TE, LCLUC, BEFT, OVWST, SST and others exist
- Other areas are interested in formation but how – Cryospheric Sciences, AC, etc.
- Team Leaders needed/competed?





A.28 and A.46 – Terra and Aqua - Measurement Teams

Continuing/evolving measurement streams, there should be one science team, competed periodically, that provides scientific guidance to present and future missions and for the utilization of past data sets

- Support and focus on Earth System Data Records
- Data system to ensure a “seamless” time series
- Scientific guidance and priorities must represent broad user community (including outside of NASA)
- NPP VIIRS continuity, DS missions, CI missions, international missions





Issues for MODIS Team

- Sync of program element competition with Senior Review
- Evolution/migration of Existing Algorithms to Senior Review (new program element, A.46 as intermediate step) – we have to weigh investments versus potential outcomes?
- Algorithm refinement PIs need to provide compelling justification for the importance/utility of the algorithm improvements and/or new data products + plan for transition to core production (recognizing infusion of new knowledge)
- Algorithm developers and validation investigators should continue to address important deficiencies in key data products
- Algorithm developers need to represent broader community needs by working with them
- How best to facilitate interdisciplinary algorithm development approaches, Terra/Aqua intersensor science (2.1.1)
- Established process for regular data product and algorithm reviews – done for three new ATBDS, but is a cycle needed off the recompute cycle? Need to maintain, evolve, refine, review as needed
- Formal establishment of measurement teams and blend with MODIS Team (and other mission teams)
- MODIS website – updated and coordinated with discipline leads, team leader, project scientists





Terra and Aqua - Schedule

- NOIs due 20 March 2013
 - 184 submitted but 20 or 30 late submissions as well
- Three categories – 45-55 awards
 - Multi-Platform and Sensor Data Fusion proposals separate panel
- Proposals due 20 May 2013
- Panels summer 2013
- Selections September 2013
- Estimated start date ~ 1 November 2013
- Funding level of ~\$11.5M/yr (FY14)





A.46 Terra and Aqua – Existing Data Products

A.46 Terra and Aqua - Algorithms – Existing Data Products

The previous Terra and Aqua recompetition (A.41 The Science of Terra and Aqua; NNH09ZDA001N-EOS in ROSES-2009) solicited:

- Scientific utilization of Terra and Aqua data,
- Development of new research algorithms, and
- Maintenance and minor refinement of Terra and Aqua existing algorithms in a single ROSES element.

With this program element in ROSES-2013, NASA is soliciting:

- Maintenance and minor refinement of Terra and Aqua existing algorithms
- In ROSES-2013 with program element A.28 The Science of Terra and Aqua, NASA is soliciting:
- Scientific utilization of Terra and Aqua data, and
- Development of new research algorithms





A.46 Terra and Aqua – Existing Data Products

A.46 Terra and Aqua - Algorithms – Existing Data Products

- Continue maintenance and minor refinement of Terra and Aqua algorithms and data products selected under prior NASA awards. Continuation of research aspects of EOS Instrument Teams for Terra and Aqua sensors. Only one type of research is solicited—maintenance and minor refinement of existing algorithms for sensors on the Terra and Aqua satellites.
- Proposers wishing to analyze and exploit EOS data, as well as develop new products by combining multisensor and multiplatform data or by developing an innovative approach to data retrievals - ROSES-2013 A.28
- For all proposals, minimum calibration/validation activities that will be MINOR minor investments given the maturity of existing algorithms (minimal calibration/validation efforts needed to maintain the quality of the existing data products, such as algorithm refinement based on the accommodation of instrument changes) are welcome. No comprehensive field campaigns.
- Principal Investigators (PIs) at institutions in countries outside the U.S. are free to propose – no exchange-of-funds basis. PIs from institutions outside the U.S. who proposed to previous announcements (e.g., Earth System Science Research using Data and Products from Terra, Aqua and ACRIMSAT Satellites from 2003 or 2006 or ROSES-2009 A.41) are not required to propose here, but, as interested, should indicate to this announcement's Points-of-Contact their desire for continued participation in a measurement and/or instrument team, as well as their institutional and funding status that will allow their participation.





A.46 Terra and Aqua – Algorithms - Existing Data Products

Welcomes submission of the following proposals types:

1. For existing Terra and Aqua data products, successor proposals to those proposals selected under the former ROSES 2009 A.41 Algorithms-Existing Data Product Refinement topic area.
2. Proposals to address “orphan” existing data products. Orphan data products are data products that a) did not have a proposal submitted for review in response to the ROSES- 2009 but did have a proposal selected in earlier EOS solicitations for Terra and Aqua data products; and b) proposals for existing data products that were represented by a proposal submitted in response to ROSES-2009 A.41 Algorithms-Existing Data Products that were not selected.
3. Proposals to maintain and make minor refinement to mature data products selected under the “Algorithms – New Data Products” program subelement in ROSES-2009 A.41 that have gone through Algorithm Theoretical Basis Document review and are in routine production will be considered.

Proposals to pursue significant changes to existing algorithms should be submitted to ROSES- 2013 A.28's Section 2.2 Algorithms – New Data Products. [NOIs 5.15.13 / Proposals 7.1.13]





Issues for MODIS Team

- More interdisciplinary algorithm development approaches, Terra/Aqua intersensor science
- Certain algorithm developers and validation investigators should address important deficiencies in key data products (uncertainties)
- Algorithm developers represent broader community needs by working with them
- Algorithm refinement PIs need to provide compelling justification for the importance/utility of the algorithm improvements and/or new data products + plan for transition to core production (recognizing infusion of new knowledge) – move to MO&DA in mission extension proposals
- Established process for regular data product and algorithm reviews – done for three new ATBDs, but is a cycle needed off the recompute cycle? Need to maintain, evolve, refine, review as needed – would this help transition to mission extension?
- MODIS website – updates needed?
- Sync of program element competition with Senior Review
- Future MODIS team meetings – frequency, format? Transition of few/some/many team members and scientific interest to NPP sensors and data?
- Science of Terra and Aqua/NPP Science Team in ROSES 2013





Terra and Aqua – Instrument or Measurement Teams

Additional detailed guidance for the Instrument and Science Measurement Teams are provided in program element. Proposed studies may be relevant to more than one team. Proposals should request membership on the team that, to the best of their knowledge, is most relevant to their research (No exclusion).

Measurement Teams Solicited:

- 3.1 Land Measurements Team (LCLUC)
- 3.2. Ocean Biology & Biogeochemistry Measurements Team (aka OCRT)
- 3.3 Cryospheric Sciences Measurement Team
- 3.4 Atmospheric Science Measurement Team
- 3.5 Geodynamics and Geohazards Research Team
- 3.6 Biodiversity and Ecological Forecasting Team
- 3.7 Sea Surface Temperature Science Team





Measurement Teams

Historical Philosophy: Continuing/evolving measurement streams, there will be one science team, competed periodically, that provides scientific guidance to present and future missions and for the utilization of past data sets

- Support and focus on Earth System Data Records
- One data system to ensure a “seamless” time series
- Scientific guidance and priorities must represent broad user community
- Future MODIS Team Meetings – structure and function given advertised dollars, change in size and issues
- NPP VIIRS continuity, DS missions, CI missions, international missions

